



ORIGINAL RESEARCH ARTICLE

Frontal myectomy: An alternative to reduce frontal wrinkles

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Abstract: Introduction and objective: Cutaneous, subcutaneous and bony changes are characteristic of the aging face over time. Loss of soft tissue elasticity, volumetric changes and facial muscle activity are largely responsible for facial wrinkles and their treatment is the most frequent request of patients seeking facial rejuvenation. The aim of this study is to describe an alternative surgical technique to treat frontal wrinkles with less morbidity and longer lasting results. **Material and method:** We collected a total of 31 patients between 37 and 75 years of age who underwent frontal myectomy between 2003 and 2007. The incision was divided over the upper eyelid, precapillary and transcapillary. **Results:** Postoperative recovery time was short, with oedema around 5–7 days; they returned to normal activities within 7 days. No patient had intraoperative or postoperative complications. **Conclusions:** The treatment of horizontal forehead wrinkles with frontal myectomy is a fast, minimally invasive procedure that offers a satisfactory result.

Keywords: frontal rhytidectomy; facial wrinkles; myectomy

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Introduction

Until the use of botulinum toxin, various surgical procedures were used on the frontal area to treat expression lines and wrinkles. As early as 1964, Marino performed an incision of the frontalis muscle without any muscle resection to direct the subcutaneous adhesion and the galea^[1], and later Pitanguy, in 1981, made vertical and horizontal incisions in the aponeurosis^[2]. Other authors recommend resection of a portion of the frontalis muscle in the midfacial area, the most common region of wrinkle formation, keeping the frontalis muscles above the eyebrow to preserve normal facial expression^[2].

The treatment of frontal wrinkles underwent a revolution in aesthetic practice after the introduction of botulinum toxin. However, for many patients, its price and the

short periods of time for which the results are maintained are major disadvantages of this procedure^[3].

For selected patients, the technique of neuromyectomy of the frontal region may give a longer and more durable result than botulinum toxin, but with the advantages of a less invasive alternative compared to previous surgical techniques. A variant of this technique is the use of an endoscopic approach, which allows a direct view of the structures to be treated. However, it requires specific training, special surgical instruments, and longer operating times^[4].

To select the most appropriate technique for treating the forehead, a detailed preoperative interview and thorough evaluation of the patient is necessary. Those with ciliary ptosis or hypermotility of the corrugator and brow depressor muscles will require adjunctive procedures such

as corrugator myectomy or procerus myectomy^[5].

Frontal myectomy was traditionally performed with total resection of the muscle. We have modified this technique by preserving the lateral part of the frontalis muscle, which treats frontal wrinkles but preserves the lateral suspension that keeps the lateral brow in a raised position and gives the face a youthful appearance. When a segment of the muscle is resected, the motor branches of the frontal nerve are also removed, which causes atrophy of the medial part of the remaining muscle. The procedure is thus a combination of myectomy and neurotomy^[6].



Figure 1. Frontal myectomy, possible incisions: precapillary, transcapillary and transpalpebral; muscle resection area.



Figure 2. The white lateral area shows the muscle resection part and the central area, in the third figure, indicates muscle atrophy of the remaining muscle.

The surgical technique we describe in this study can be performed through transcapillary, precapillary or transpalpebral incisions, the latter usually in association with upper blepharoplasty (Figures 1 and 2). To avoid ptosis of the central part of the frontalis, we recommend suspension methods, such as the one proposed by Graziosi^[6,7].

This technique can also be used to symmetrise the frontal area in patients with facial paralysis.

Material and methods

Surgical technique

We perform the preoperative assessment of the patient in an upright position to define the exact location and magnification of the frontal wrinkles. We also assess the position of the brow, symmetry and ptosis (Figure 3).



Figure 3. Preoperative static and dynamic image in a patient planned for temporal fascial neck lift surgery with precapillary incision in the temporal area, frontal and orbicular myectomies and lower blepharoplasty.

Myectomy can be performed together with a facelift or as a stand-alone procedure. The patient should be warned about the possibility of temporary or permanent paraesthesia, anaesthesia, as well as injury to sensory branches, despite careful dissection. It is also important to discuss the possibility of asymmetry and the need for an eventual touch-up procedure.

Patients at any risk of ptosis should be considered for simultaneous brow lift, which can be performed through a transpalpebral incision. If there is high activity of the corrugator and procerus muscles, an associated myectomy of these muscles will be necessary, which can be done by transpalpebral or endoscopic technique^[7].

During the preoperative assessment, the patient should raise the eyebrow to define the lateral margin of the frontalis muscle, which we mark with a vertical line. We draw another line approximately 1 cm medially; this line will be the lateral extremity of the myectomy. Another line approximately 1.5 to 2 cm towards the midline will be the medial end of the myectomy. If the resected segment is less than 1.5 cm, nerve regeneration will occur with a consequent total loss of the result^[6]. We must perform the



Figure 4. Intraoperative image. Careful dissection, under magnification, of the sensory nerve branches to resect the frontalis muscle.



Figure 5. Dissected frontalis muscle fibres.



Figure 6. Patient undergoing frontal myectomy through transpalpebral incision under local anaesthesia and sedation.

myectomy leaving sufficient muscle to avoid ciliary ptosis. The lateral limit of the resection is at the lateral pupillary limbus in order to preserve the arch of the eyebrow^[6].

For the surgical procedure we used local anaesthesia with lidocaine 0.5% and adrenaline 1:80,000, subcutaneously, with optional anaesthetic block of the supraorbital and supratrochlear nerves^[6,8].

The incision shall be short and zigzag-shaped when pre-capillary or linear when transcappillary, in a lateral part of the frontal area, and with an extension of 1.5 cm. This allows the superficial plane of the frontalis muscle to be seen. The dissection of the muscles will be superficial and inferior between the subcutaneous and frontalis muscles up to 5 mm above the brow line. This dissection should be performed in the area of myectomy^[6].

At the lower point a transverse incision is made and at this level the dissection plane will be deeper and over the entire marked area. The muscle fibres are carefully removed to preserve the sensory nerve branches. For this reason, it is important to use magnification (**Figures 4 and 5**).

We perform the same procedure on the other side of the face, taking care to ensure symmetry. A minor contour defect may occur, especially in patients with muscle hypertrophy or very thin skin. After myectomy, we must evaluate the depression of the resected area to assess the need for a fat graft at that level, which may be from the SMAS, liposuction, or abdominal area in bloc, and fixed with 5-0 transcutaneous suture to be removed 5 days post-operatively.

This type of myectomy can be performed on the most lateral part of the frontalis muscle to preserve the entire frontal region. When the patient wants to observe movement in the lateral area and the eyebrow suspensions, the lateral part should be preserved (1 to 1.5 cm).

The resection can also be done through an upper blepharoplasty incision (**Figure 6**). After skin resection, we would continue with dissection under the skin margin and the orbicularis muscle to find the frontalis muscle. In this case, the resection will be in the same marked area as previously explained. The length of the resected muscle should be at least 2 cm.

Frontal myectomy can cause brow ptosis due to gravity and the action of depressor muscles (orbicularis, procerus and corrugator); we can avoid this with fixation sutures as described by Graziosi or with a subperiosteal endoscopic facelift^[9,10].

To achieve better results, this technique can be associated with orbicularis myectomy to treat periorbital wrinkles, more commonly known as “crow’s feet”^[10].

Results

We have applied the described technique in 31 patients aged 37 to 75 years (mean 53.45 years) from 2003 to 2007: 27 women and 4 men. The same surgeon performed all procedures. The incision was divided over the upper eyelid ($n = 4$), precapillary ($n = 22$) and transcapillary ($n = 5$). All surgeries were associated with other procedures such as: facelift (25 surgeries), blepharoplasty (7 surgeries), orbicularis myectomy (25 surgeries), chin liposuction (5 surgeries), rhinoplasty (1 surgery) and procerus myectomy (3 surgeries).

The operated patients had a short recovery time, with oedema lasting approximately 5–7 days, and returned to normal activities in an average time of 7 days (minimum 5 and maximum 10). There were no intraoperative or postoperative complications (**Figures 7–9**). Four patients required a second surgical intervention due to unsatisfactory outcome of muscle paralysis (2 after 4 days, 1 after 30 days and 1 after 3 months).

Discussion

Surgery of the frontal area requires a correct understanding and knowledge of its anatomy and particularities; this is the only way to avoid complications and mediocre or undesirable results.

The frontal anatomy is composed of several layers: the frontal bone, fascia, muscle, subcutaneous tissue, dermis and epidermis. The fascia is further divided into two parts, deep and superficial. The temporal superficial fascia is continued by the galea and the deep fascia is continued by the periosteum. The superficial fascial layer lies beneath the subcutaneous tissue, and deep to it run the



Figure 7. Preoperative and postoperative period at 1 year and 6 months in a 61-year-old patient with facelift surgery, frontal and orbicular myectomies, improvement in frontal and orbicular wrinkles was obtained.



Figure 8. Preoperative and postoperative period at 10 months in a 51-year-old patient with frontal myectomy through intracapillary incision. It is possible to notice the treatment of frontal wrinkles and eyebrow suspension without any other associated surgical method.

superficial temporal vessels and branches of the facial nerve. The deeper, lower fascial layer is attached to the frontalis muscle and periosteum^[11,12]. The frontalis muscle is a thin, two-part structure and is contiguous with the aponeurotic galea. It is sandwiched between the superficial fascia and the deep fascia^[11,12].

The supratrochlear nerve divides into 3 or 4 branches and innervates the frontalis muscle. The supraorbital nerve is responsible for sensation on the upper eyelid and forehead, with the exception of the portion supplied by the supratrochlear nerve^[11,12]. The motor innervation of the frontalis muscle is provided by the temporal and zygomatic branches of the facial nerve. Injury to the temporal branch may cause paralysis of the frontalis, orbicularis and corrugator muscles, resulting in ciliary ptosis^[11,13].



Figure 9. Preoperative and postoperative at 1-year period in a patient with frontal myectomy. It is possible to see the treatment of the frontal wrinkles in the eyebrow elevation movement.

Facial wrinkles are among the signs of ageing that patients between the ages of 40 and 60 most often request correction of. Superficial wrinkles are associated with changes in skin texture caused by intrinsic ageing and photoageing. In turn, these frontal wrinkles can be static or dynamic. Wrinkle lines are usually confined to the superficial dermis, which is why we can treat them with dermabrasion or with procedures using different types of lasers. Mimetic wrinkles are the visible effects of deep dermal folding caused by repeated facial movement and expression gestures combined with dermal elastosis^[14].

There are several procedures to treat these frontal wrinkles; many are quick and minimally invasive, such as botulinum toxin and the injection of dermal fillers. However, these methods are expensive in the long term and have a short duration of results, having to be repeated every 3–6 months^[15]. As for surgical procedures, they were described to improve the appearance of the forehead by removing wrinkles and other signs of ageing. After the first descriptions by Marino with his incision on the frontalis muscle, authors such as Uchida, in 1965, proposed surgical techniques to correct hypermotility of the frontalis muscles^[1,16]. After this, many other surgeons proposed techniques to achieve improvement and longer lasting results, with multiple surgical procedures that can be done through coronal, temporal, transcapillary or endoscopic incisions.

Our work proposes a technique based on a small incision, which is therefore less invasive, with few negative consequences and good and long-lasting results. The mean follow-up time of the patients in our study group was 21.1 months (minimum 1 month and maximum 5 years).

Partial frontal myectomy associated with

neurotomy can be performed through small incisions, pre-capillary, transcapillary and also transpalpebral. This technique, associated with other procedures such as facelift and blepharoplasty, leaves a lateral part of the frontalis capable of maintaining the movement and suspension of the eyebrow, which favours a more youthful appearance of the face.

In addition, it is a surgical method that can be associated with complementary procedures such as facelift, orbicularis oculi myectomy or blepharoplasty, depending on the requirements of each patient.

Finally, we would like to point out that, for its application, we consider it very important to carry out a complete preoperative and individualised evaluation of the patient in order to ensure the correct indication of the technique and the achievement of a harmonious and complete facial result.

The treatment of horizontal forehead wrinkles using the frontal myectomy technique is a fast and minimally invasive procedure, with a satisfactory result, maintained, in our experience, over a period of 2 to 5 years.

After an adequate preoperative evaluation, it can be associated with other techniques such as transpalpebral myectomy, corrugator myectomy and procerus to achieve a better aesthetic appearance of the upper third of the face.

Conflict of interest

The authors declare that they have no potential conflict of interest.

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